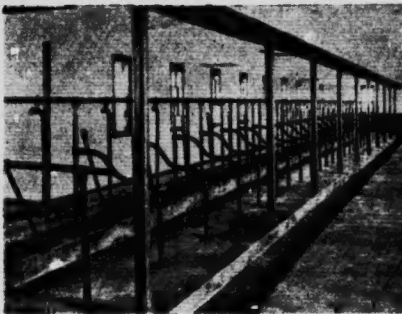


BULLETIN NO. 15

DEPARTMENT OF AGRICULTURE, SASKATCHEWAN
(SECOND EDITION)

CAUSES OF CONTAMINATION
AND
THE CARE AND PRESERVATION
OF
MILK AND CREAM
ON THE FARM

BY
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CLEANLINESS AND SUCCESS

DISEASE AND FAILURE
(Note the Dirt on Flanks)

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INTRODUCTION

Although this publication has been prepared especially for creamery patrons, the advice and instruction offered will be found useful to those who make butter on the farm.

The recommendations herein contained are intended to assist in the preservation and care of milk and cream, and the objects are to discuss clearly and briefly conditions that favour the rapid deterioration in quality, and to outline the simplest and most effective remedies that may be practised by the farmers generally but more particularly by creamery patrons.

Lengthy comments on the various headings under discussion have been purposely eliminated and absolute facts, with brief explanations, take their place. This, the writer thinks, will induce more dairymen to read and subsequently practise the methods herein recommended than if an extensive elaboration were given on the many forms of contamination and methods for their prevention.

In most cases the methods followed in handling milk and cream are far from what they ought to be. The importance of the dairy industry warrants every possible precaution being taken to improve existing conditions and to secure a uniformly fine quality of milk, cream and butter. For convenience the subjects will be dealt with in the following order:

- General.
- Origin of flavours.
- Conditions favouring development.
- Cleanliness.
- Effect of temperature.
- Thermometers.
- Rich cream.
- Frequent delivery to creamery.

GENERAL.

Producers, merchants, wholesale dealers, manufacturers, and consumers are already aware that dairy products readily become sour, tainted, rancid, and unwholesome, in many cases unfit for human consumption. Their knowledge or appreciation of the conditions that so rapidly bring about these changes is very often quite limited. The chief or most important causes may be reduced to five general headings, and the excellent or inferior product can invariably be traced to the practice of the desirable or undesirable methods tabulated below:

GOOD QUALITY.

- Cleanliness.
- Low temperatures.
- Rich cream.
- Frequent delivery.
- Succulent feeds.

POOR QUALITY.

- Lack of cleanliness.
- High temperatures.
- Thin cream.
- Delivery at long intervals.
- Unpalatable and unwholesome feeds.



IMPURE AND UNDESIRABLE SURROUNDINGS.



THE MEADOW FURNISHES GOOD SURROUNDINGS FOR SECURING PURE MILK.

To insure the finished product being strictly first-class the most important part of the dairyman's work is cleanliness. Of almost equal importance is the practice of cooling the cream to a low temperature. The third chief factor is skimming a rich cream; the fourth, frequent delivery to the creamery; and fifth, succulent feed for the cows.

ORIGIN OF FLAVOURS.

Milk, cream, and butter are always best when strictly fresh. Time never improves the flavour. On the contrary there are changes continually taking place that result always in a poorer quality. Such changes are brought about by a process of fermentation or decay caused by the development or growth of minute forms of plant life generally called "germs," "bacteria," "microbes," "organisms," or "micro-organisms," all of which are synonymous terms. They can be seen only by the use of a powerful microscope, while their existence is established from the undeniable changes that occur in all decaying matter, the most common in dairy products being the "souring of milk." There are many species of germs which infect milk and each produces its own peculiar flavour. They are present almost everywhere and in great numbers in all decaying matter. They float in the atmosphere and adhere to dust particles. Especially is this so in the cow stable. They inhabit streams and sloughs and are present to a greater or less extent in all well water, also in the soil to a depth of several feet, the number decreasing with the depth. Germ life may be said to be present all around us. The principal sources, however, so far as milk is concerned, are unclean dairy utensils, unclean cows, and unclean stables.

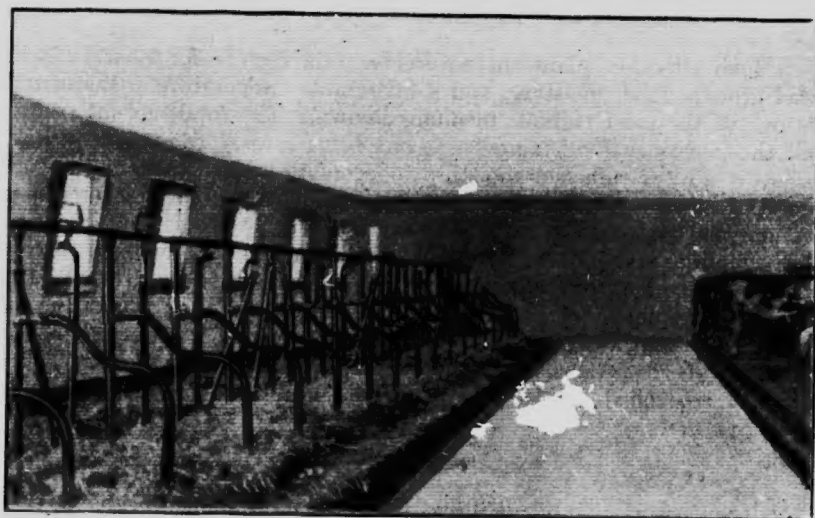
CONDITIONS FAVOURABLE FOR GERM GROWTH.

Like all other plants in nature bacteria require for their existence and growth, food, moisture, and a favourable temperature. Warm milk is one of the most suitable mediums known. The solids-not-fat contain all the necessary food ingredients and being largely composed of water there is always sufficient moisture to promote growth. From the foregoing it is apparent that milk and cream cannot be produced for general commercial purposes without containing some germ life, but it should be the aim of each producer to prevent their entrance as much as possible. It is also evident that once the product becomes inoculated with bacteria they immediately find suitable conditions for growth and reproduction, so far as food and moisture are concerned. But the means whereby their entrance can be prevented and the multiplication subsequently controlled consists in practicing cleanliness and observing low temperatures.

CLEANLINESS.

The classification of conditions that give rise to objectionable flavours are given herewith and as nearly as possible in the order of importance. It is, however, sometimes difficult to say from which source the most trouble comes:

- Dirty hands, teats and udders when milking.
- Damp, filthy, dark, unventilated stables.
- Wet and dusty milking corrals.



TWO SASKATCHEWAN DAIRY BARNs.

Uncleaned and improperly cleaned separators and dairy utensils.

Separating the milk in stables.

Exposing the milk and cream in an impure atmosphere.

Milk standing in or near stables, corrals, or foul surroundings.

Wooden, galvanised and rusty pails.

These objectionable methods and undesirable conditions should be avoided, and the following modern and cleanly methods substituted and practised and better conditions made prevail:

Wash or moisten the cows teats and udder before milking and milk with dry, clean hands.

Provide for plenty of sunlight and ventilation in the stables, and keep the walls, ceiling and floor clean and dry.

In summer, milk in a clean stable or grassy corral.

Wash the separator and dairy utensils immediately after each milking, first in lukewarm water, then in hot water, and finish by scalding with clean boiling water or steam.

Separate the milk where the surroundings are clean and the atmosphere pure.

Keep the cream vessels covered.

Use only tin milking pails. The covered pail is preferable.

EFFECT OF TEMPERATURE ON GERM LIFE.

The universal prevalence of germ life makes it impossible under general dairy practice to prevent wholly their entrance into the milk, or to produce milk that will not, in time, spoil or become rancid. By



(a) The ordinary type of pail showing sharp angles between sides and bottom which are difficult to clean.

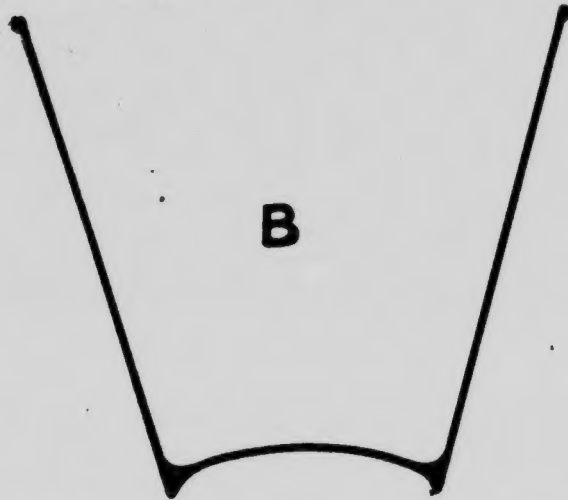
observing the conditions with respect to cleanliness, contamination can to a large extent be prevented and the period which milk and cream will remain sweet can be greatly prolonged. Cleanliness supplemented by the practice of cooling the cream immediately following separating

to a temperature of 55 degrees Fahr. or below and maintaining it so, makes it easily possible to produce cream of high quality. In this regard I should strongly urge that you avoid:

Allowing the milk to remain at a high temperature for several hours before separating.

Permitting the cream to remain after separating without being cooled.

Putting the cream in a cool place and allowing the temperature to reduce gradually.



(b) The same pail properly flushed with solder which makes it easy to clean.

By substituting and practising the following procedure much better results will be obtained:

Separate the milk immediately after milking.



The covered milk pail will reduce contamination by 25 per cent.

Cool the cream with cold water immediately after separating to a temperature of 55 degrees Fahr. or below, with ice in the water if possible to have it.

Keep the cream cold until it is delivered at the creamery.

Since a low temperature retards fermentation the sooner milk is separated and the cream cooled the better the quality will be. At temperatures between 60° — 100° the flavour changes very rapidly because bacterial growth is rapid; between 50° — 60° the change is much slower,

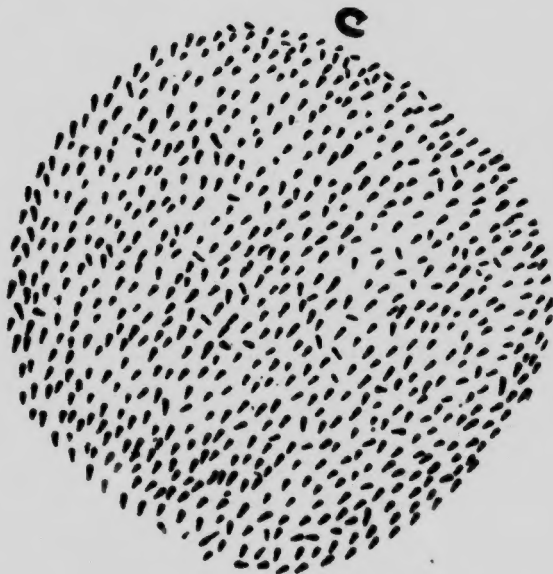


a. Single bacterium.



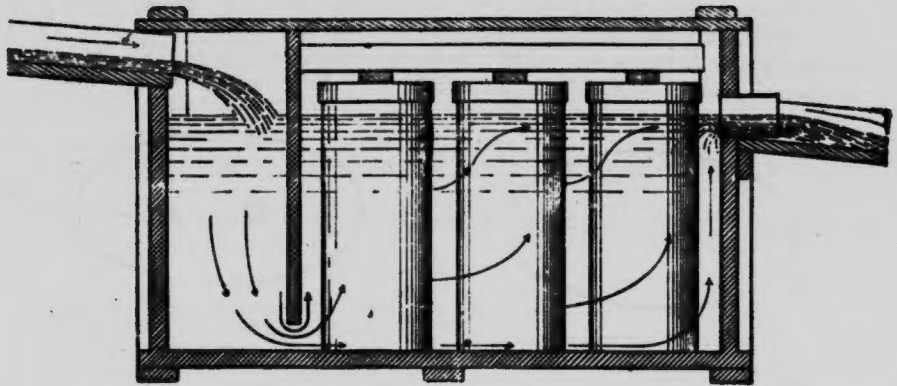
b. Progeny from growth of one bacterium in 24 hours in milk at 50° degrees of temperature. The increase is five.

while below 50° it is almost checked. The limits of growth may be fixed at freezing point and 110° Fahr. In farm dairy work it is not practicable to adopt high temperatures to check the growth, consequently a low temperature is the only available means of retarding bacterial growth and thus preserving the fine flavours in milk and cream.

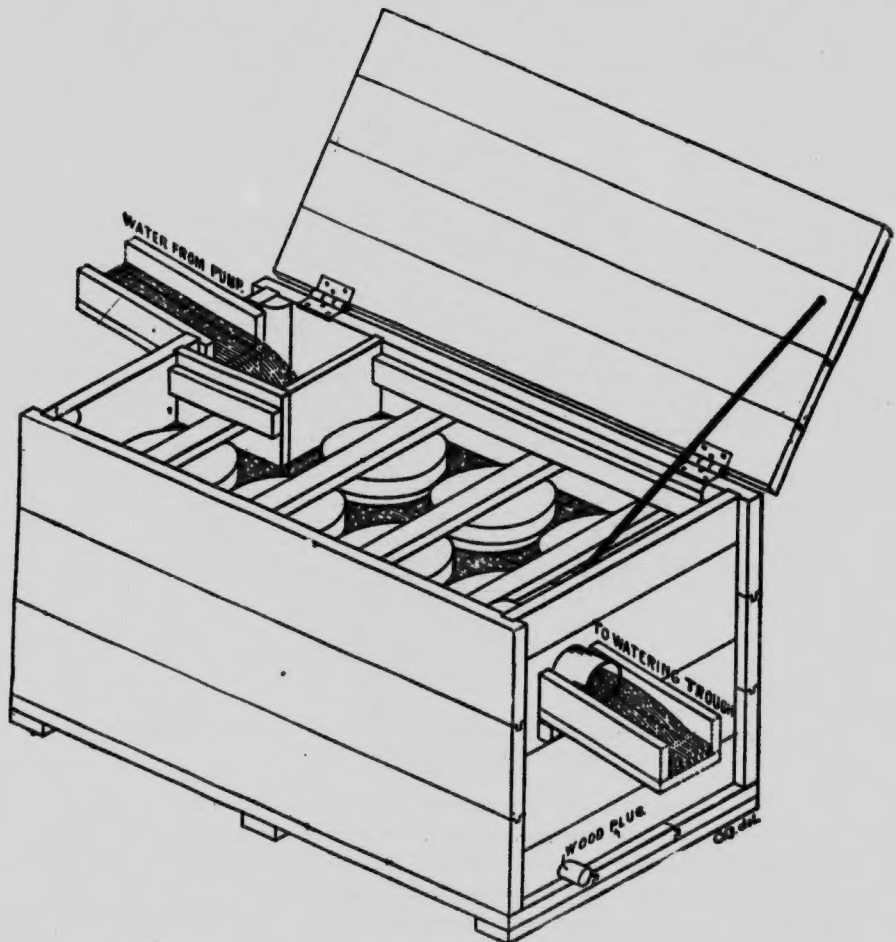


c. Progeny from growth of a bacterium in 24 hours in milk at 70° degrees of temperature. The increase is 750.

I know of no simpler or more effective means of cooling cream than that shown in the following illustration which is self-explanatory. Have the cooling tank between the well and the watering trough. The water can then be pumped into the tank and the overflow of the warmer water goes to the trough. Ice in the water adds to its cooling efficiency. The ordinary "shot gun" can afford a suitable receptacle for catching the cream from the separator and is also a good form for placing in the

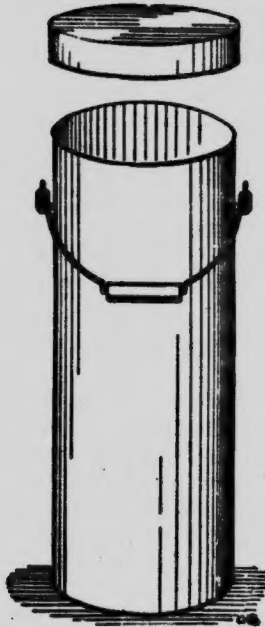


CROSS SECTION OF COOLING TANK.



TOP VIEW OF SAME TANK.

water tank. This can is durable, easily cleaned, and covered. While the tin is strong it is not too thick to retard cooling. Stir the cream occasionally while it is being cooled, say about once every two hours, and when the fresh cream has been reduced to the temperature of the older cream they may be safely mixed. Never mix the fresh cream with the old before cooling.



A SUITABLE CAN IN WHICH TO COOL MILK AND CREAM.

THERMOMETERS.

Every dairyman should use a thermometer because without it one must guess at the temperature. The practice of using one's finger to ascertain this is not modern or reliable. The cost of a thermometer is about 25 cents. Its accuracy can be determined by placing it under one's tongue for about two minutes when it should register 98 degrees. This is the approximate temperature of a person in good health. Whatever the thermometer may vary from this may be noted and subsequent readings corrected accordingly.

RICH CREAM.

Another factor which will assist in producing good flavoured cream is to skim it rich so that it will test at least 35 per cent. Germs feed on the ingredients of the milk serum, or the substances contained in the skim milk. Butter fat so far as is known is of little value as germ food. Between a 20 per cent. and 35 per cent. cream there is in every 100 pounds of each 15 pounds more of the milk serum in the former than in the latter. In consequence of this it is possible for more germs to be in the thin cream where there is more food for them, and deterioration is more rapid. Reduce

the germ and food content and the cream will keep sweet for a longer period. Besides, the farmer retains more skim milk at home for feeding purposes when a 35 per cent. cream is skimmed. Space for holding cream is saved and cost of hauling is reduced. To present a summary of advantages:

The cream will keep sweet for a longer period.
There is less skim milk sent away from the farm.
The space for storing cream is saved.
Cost of hauling is reduced.

FREQUENT DELIVERY TO CREAMERY.

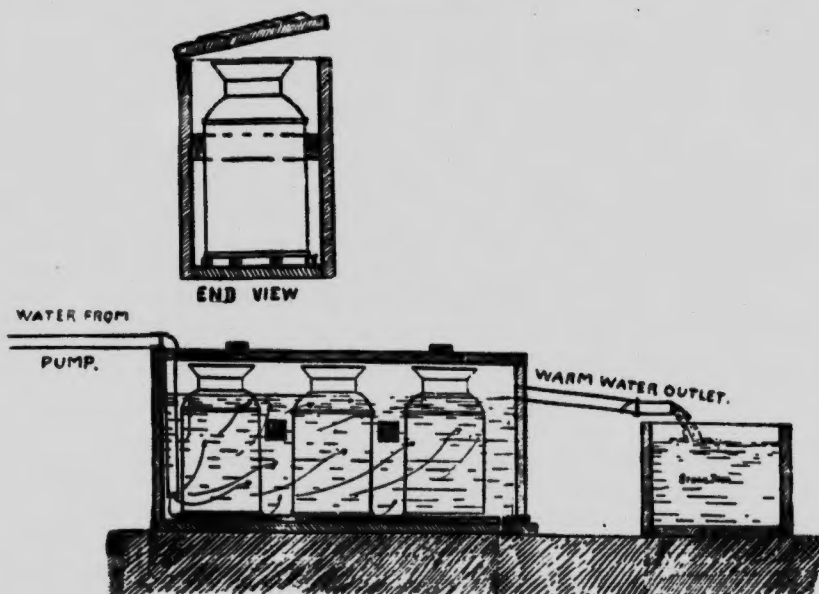
Still another means which will aid in producing first class cream and butter, is to have the cream made into butter before any strong odours develop. The common practice is semi-weekly delivery and sometimes only once a week. Three deliveries is much preferable where arrangements can be made to this effect consistent with economy.

METHODS OF PRODUCING CLEAN, SWEET CREAM REDUCED TO SIMPLICITY.

It is impossible to produce clean milk and cream unless the cows, stable, milker, utensils and separator are clean.

To wash milk utensils use, first, cold water for rinsing; second, warm water containing a small quantity of good washing powder, for cleaning; third, boiling water or steam for sterilising.

Use a metallic strainer; it is practically impossible to keep cloth strainers sweet and clean and free from bacteria.



TANK FOR KEEPING CREAM COOL WHILE HELD AT THE FARM.

Skim the milk as soon after milking as possible, and cool the cream at once.

Skim the cream testing from 35 to 40 per cent.—the richer the cream the better it will keep. By skimming a rich cream, more skim milk is left at home for feed, and there is also smaller bulk on which to pay express charges.

Do not mix warm new cream with cold cream until it has been cooled.

Keep the cans of cream in a tank of cold water until time of delivery.

Wash the separator thoroughly after each separation.

Deliver the cream to the creamery early in the morning or to the railway station half an hour before train time.

Deliver the cream not less than three times a week during the summer, and twice a week during the winter.

Protect the cans of cream from the sun by covering with canvas or with a wet sack while en route.

The cut shows the simple cooling tank that may be built by any farmer. Such a tank may be build of wood or cement and should be made as high and wide as will be required to accommodate the cans as shown in the illustration. The length will depend upon the number of cans to be used at once.

SUMMARY.

In the conduct of their work, farmers, cream haulers and creamery managers should bear in mind that "quality" is the important factor in extending and securing the markets for butter. The quality of the cream depends upon the man, the flavour and quality of the butter depend upon the flavour of the cream, and the price depends upon the quality of the butter. There is a large market that wants good butter and is quite willing to pay for it. Our aim should be to supply the best. The whole matter of production, development, extension of markets, and, to a large extent, profits may be summed up in the one word "quality," and this in turn rests with the "man."